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MEMORANDUM

To: Parties Interested in Demand Management Issues and Water-Use Efficiency Analysis

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From: Dr. Peter H. Gleick, Pacific Institute, 654 13th Street, Oakland, CA 94612
Date: May 20, 1998

Re: Application of Applied Water/Real Water/New Water Distinction in Bulletin 160-98 and CALFED DEIR/DEIS

A fundamental assumption underlying water-use projections in the draft Bulletin 160-98 report (and subsequently adopted in the CALFED draft EIR/EIS) relates to the utility of water-use efficiency improvements and their implications for future water supply and demand. This memo describes a flaw in that assumption that leads to a large overestimate of future urban water demand. We are circulating this memo in order to solicit comments on our analysis and to begin a discussion about how best to correct this error.

Bulletin 160-98 and the CALFED DEIR/DEIS draw a distinction between "applied water," "real water," and "new water." This distinction has long been understood in agricultural water analysis and under certain circumstances it is very useful. In recent years it has been applied in Asia and Africa. Among other things, this distinction can help identify where improvements in water-use efficiency may be most appropriate and valuable.[1]

This approach is based on the idea that in a region with limited water resources and 100 percent downstream reuse, any reductions in non-consumptive uses of water do not produce "new" water because any water saved is already committed for use by a downstream user. In a region with **fixed demand**, therefore, only reductions in consumptive uses produce "new" water. This line of reasoning, when applied to calculations of agricultural water use, is justifiable.

Bulletin 160-98 and, subsequently, CALFED, adopted this approach in their analysis of the potential for improvements in water-use in all sectors. Problems arise because DWR applied this approach to inland urban water use in a situation of **growing demand**. In such a situation, improvements in water-use efficiency do not lead to "new" water being

[1] See, for example, Keller and Keller, 1995, "Effective efficiency: A water use efficiency concept for allocating freshwater resources," Center for Economic Policy Studies, Winrock International, Arlington, VA; Molden, 1997, "Accounting for water use and productivity," International Irrigation Management Institute (IIMI), Sri Lanka; and Seckler, 1996, "The new era of water resources management: From 'dry' to 'wet' water savings," Research Report 1, International Irrigation Management Institute (IIMI), Sri Lanka.

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created, but they do lead to real reductions in assumed future demands in a region. This is independent of whether that region returns water to a saline sink or downstream user.

This error leads DWR and CALFED to ignore improvements in urban water-use efficiency in inland regions. This, in turn, leads to a significant overestimate of future urban demand for water. Even adopting DWR's conservative assumptions about the potential for demand management (discussed briefly in our public comments on the Bulletin 160-98 draft and in more detail in our report to the Bureau of Reclamation on CALFED's water-use efficiency technical appendix), this single error leads to an overestimate in future urban demand of far more than one million acre-feet.

Figure 1, attached here, outlines in graphic form the Bulletin 160-98/CALFED error. In this representation, two cities take water, one after another, from a river with average renewable supply of 500 units. In time period 1 (assumed here to be 1995 "Base Case"), each city withdraws 100 units of water, "consumes"' (consumptive use) 40 units of water, and returns to the river ("non-consumptive use") 60 units for reuse by other users downstream. These proportions, as well as the figure itself, were modeled on B-160's Figure 4-1.

At some time in the future (assumed by DWR/CALFED to be 2020), population growth increases the demand for water. In order to estimate these future water needs, DWR assumes a per-capita water demand and multiplies that demand by future population projections. Although it is not clear from the document (draft Bulletin 160-98), we assume here that DWR uses a value for per capita demand that has been adjusted for full implementation of the BMPs.[2] DWR and CALFED then assume that no further conservation in inland urban areas produces new water, because that water is already committed to other downstream uses.

In a situation with growing demand for water, as assumed by DWR, this approach fails to account for the real reduction in future demand that conservation options produce. In Figure 1, 2020 Base Demand for each city is assumed to rise 50% to account for population growth (from 100 units to 150 units). Thus each city would demand 150 units of water, consumptively use 60 units, and return 90 units to the river. Total basin demand would thus rise from 200 units to 300 units; total base consumptive use would rise from 80 units to 120 units, and downstream flows would drop from 420 to 380 units. Under this scenario, DWR argues that an increase in supply of 100 units is needed (2020 base demand –1995 base demand).

Under a scenario with 20% potential urban conservation in both consumptive and non-consumptive uses, 2020 Conservation Demand in each city would drop to 120 units. Total 2020 Conservation Demand for the two cities would thus be 240 units, a real reduction in demand of 60 units from the 2020 Base Demand scenario. In this scenario, final downstream flow drops only 16 units, not the 40 units DWR would project. If 1995

[2] Bulletin 160-98 estimates that "full implementation" of the urban Best Management Practices (BMPs) will save 1.5 million acre-feet of water by 2020, though no information in the Draft is available to support this estimate. The Bulletin 160-98 Draft also does not make clear if and how this value is applied to the future demand projections because insufficient information is provided on how future urban demand is computed. DWR staff, as of the date of this memo, has not been able to provide further information on the quantification of BMP savings. The CALFED Water-Use Efficiency Appendix also does not make clear how BMP savings are accounted for in each region. We hope that further discussions with DWR and CALFED staff will clarify this important point.

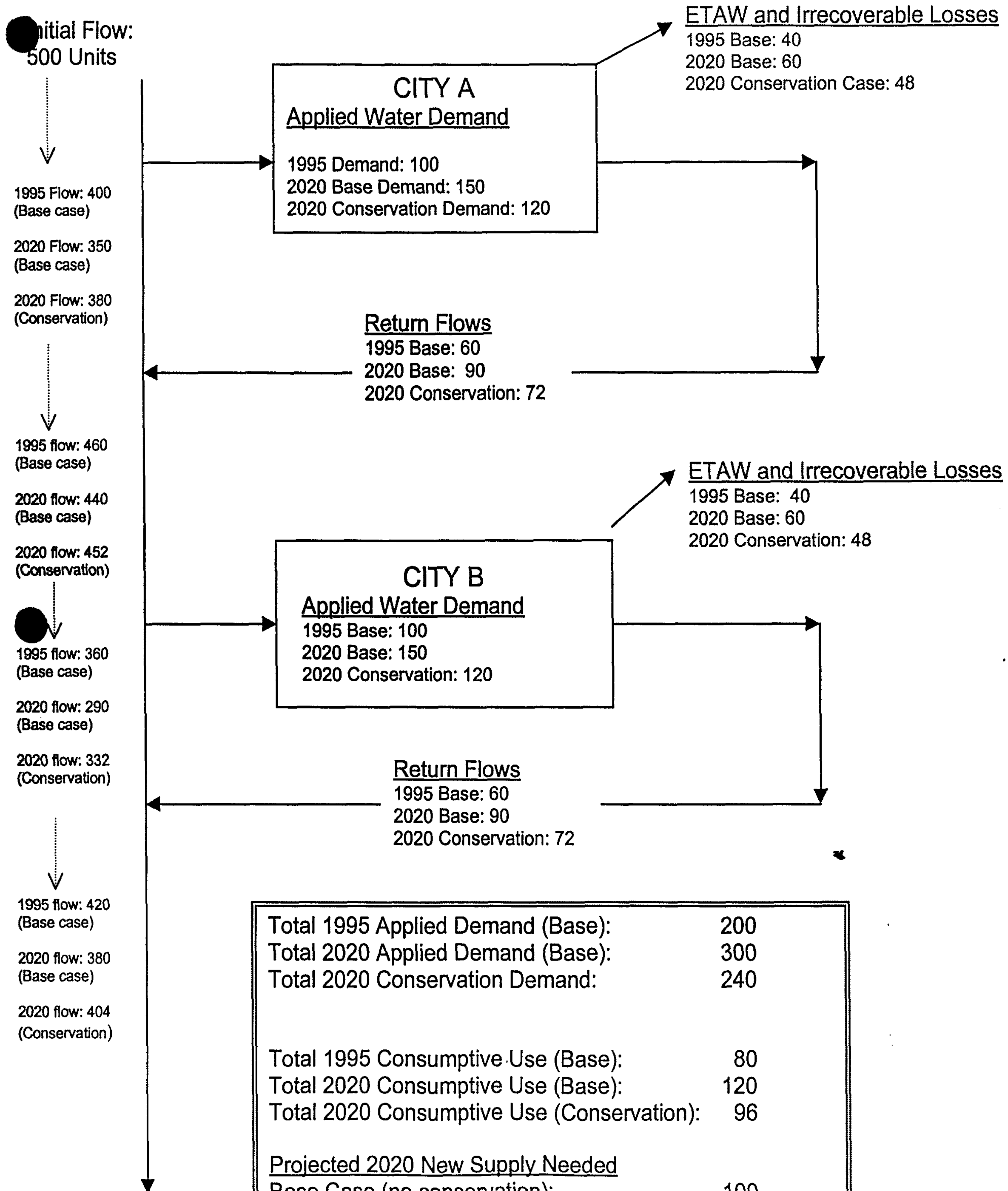
supply and demand are in balance, these conservation options would reduce the future gap between supply and demand from 100 units to 40 units. Because no "new" water is created, however, DWR ignores these savings.

This real reduction in demand holds true even if the conservation potential is limited to non-consumptive uses. In this case, a 20% reduction in urban non-consumptive uses would reduce total 2020 demand from 300 units to 264 units by reducing non-consumptive uses from 180 units to 144 units (this scenario is not shown on Figure). Even in this conservative scenario, which assumes no potential savings in consumptive uses, a real reduction in demand of 36 units is achieved.

These results are independent of location: it doesn't matter if a city is inland, with 100% downstream reuse. Demand reductions in non-consumptive uses still lead to reductions in overall demands, directly reducing the magnitude of new supply needed and reducing the impacts of growing populations.

In numerical terms, this error means that the distinction drawn in CALFED between the "applied water" and "real water" savings attributable to inland urban areas should be eliminated, and that all applied water savings potential should be counted as reductions in estimated future demand on a one-for-one basis. Thus, actual urban demand reductions expected for 2020 under CALFED Actions should be the full 3.06 to 3.37 million acre-feet (listed in Table 5.5, page 5-48). In a separate analysis we will review the assumptions and basis for this number.

Urban Water Use Projections:
No Conservation versus 20% Conservation



Total 1995 Applied Demand (Base):	200
Total 2020 Applied Demand (Base):	300
Total 2020 Conservation Demand:	240
Total 1995 Consumptive Use (Base):	80
Total 2020 Consumptive Use (Base):	120
Total 2020 Consumptive Use (Conservation):	96
<u>Projected 2020 New Supply Needed</u>	
Base Case (no conservation):	100
Conservation:	40
Real Demand Savings:	60 Units

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